

B.E- VIII / CBGS / MECH / DOMS / VIII / 12-05-2017

Design of Mechanical System - I

Q.P.Code:13208

(3 Hours)



Total Marks:80

- Question No. 1 is compulsory.
- Attempt any three questions from the remaining.
- Assumption made should be clearly stated.
- Design Data Book by PSG, Mahadevan and Kale & Khandare are permitted to use.

- Q.1 Answer any four 20
- (a) "Modern Hoisting and Conveying machinery is at the heart of modern Inline Production Systems and Transfer Line" elaborate with example.
- (b) State the limitations of geometric progression. Why Geometric progression values are used in machine tool drive inspite of its limitation?
- (c) Why an I- section with $I_{xx} \leq 4I_{yy}$ is selected for connecting rod of an IC engine.
- (d) What is the significance of NPSH in Centrifugal pump?
- (e) Derive an expression for the breaking strength of the 6 X 37 type wire rope.
- Q.2 (a) Illustrate the morphology of Mechanical System Design for Centrifugal Pump with the help of flow chart. 5
- (b) For the specification of an EOT Crane , 15
- Application - Class II
- Load to be Lifted - 150 KN
- Hoisting speed - 10m/min
- Maximum Lift - 8m
- I. Design 6x37 type of rope and find its life.
- II. Design rope drum, drum shaft and bearing.
- III. Select the suitable hoisting motor.
- Q.3 (a) Draw neat sketch of belt conveyor assembly and explain the function of Snub Pulley and take up arrangement. 5

Turn Over

(b) The specification of belt conveyor system are,

Capacity	: 200TPH
Material to be conveyed	: Lime Stone
Inclination	: 12 degree
Lump size	: 90mm
Centre to Centre distance	: 100m

- I. Find motor capacity
- II. Design conveyor belt.
- III. Design troughing idler, shaft and bearing for idler.
- IV. Check the belt conveyor system for arresting mechanism.

Q.4 (a) What is optimum design? Write optimum design procedure for normal specification. 5

(b) Design following components of single cylinder, four stroke and water cooled Diesel Engine to develop 10KW at a speed of 1000rpm by making suitable assumption and neat sketches. 15

- I. Cylinder, Liner, Cylinder Head and Stud.
- II. Piston with piston pin and piston rings.
- III. Connecting Rod with small and big End.

Q.5 (a) Derive an expression for the Hydraulic force develop on the gear shaft of Gear Pump if the pressure increases from zero to P_{max} in 180 degree and remains constant on the delivery side at P_{max} . Consider the external radius of the gear as 'R' and Width of the gear as 'b'. 5

Q.5 (b) The specifications for the Centrifugal Pump are, 15

Liquid to be handled	: Water at room temperature.
Total manometric Head	: 24m
Discharge	: 900 Litres per Minute

By making suitable assumption,

- I. Find the suction and delivery pipe diameter

Turn Over

- II. Select standard Motor.
- III. Design Impeller (Basic Dimensions, Blades, Hub and shaft)
- IV. Design Casing.

- Q.6 (a) Explain with neat sketch open type and crossed type structure diagram. 4
- (b) A 12 speed Machine Tool Gear Box of 2x3x2 type is to be designed, for following 16
Specification:
- Minimum speed $N_{\min} = 40$ rpm, Progression ratio $\Phi = 1.41$
- I. Draw structural diagrams and select the best one.
 - II. Draw ray diagram and speed chart for selected structural formula.
 - III. Determine the no of teeth on each gear.
 - IV. Draw the gearing diagram.
 - V. Show the combination of gear pairs for the different speed.